«Сейфуллин оқулары – 12: Ғылым жолындағы жастар-болашақтың инновациялық әлеуеті» атты Республикалық ғылыми-теориялық конференция материалдары = Материалы Республиканской научно-теоретической конференции **«Сейфуллинские чтения-12:** Молодежь в науке - инновационный потенциал будущего" . – **2016**. – Т.1, ч.3 – С.339-343

ZIGBEE PROTOCOL RESEARCH FOR THE PURPOSE OF DESIGNING THE WIRELESS TOUCH NETWORK

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The paper deals with wireless networks, which are characterized by ultra-low power consumption and a large number of miniature devices that communicate relatively little information on the protocol ZigBee. The principal feature of wireless sensor networks is the principle of relay data circuit. This allows you to collect information from large objects that exceed in size communication range of one element.

The missions and aim of the work:

• research WSN technology

• construction of discrete event simulation model of wireless sensor network, which allows to determine the time of delivery of packages.

• to analyze, to evaluate the performance and the effect of noise and power radio transmission on the performance of the WSN

• implementation

Wireless sensor networks (WSN) are one of the most promising directions of development of modern telecommunication technologies. Promising use related both to the replacement of the cable infrastructure in the radio broadcast and new functionality [1]. Due to such characteristics of the FSU, as miniature assemblies, low power consumption, built-in radio, sufficient processing power, relatively low cost, it became possible to their widespread use in many areas of human activity in order to automate the processes of gathering information, monitoring and control characteristics of a variety of technical and natural objects.

The above mentioned features of wireless sensor networks made it appropriate to their use in solving complex problems in the following areas:

- Monitoring of telecommunications infrastructure networks,
- Monitoring of transport routes (rail, metro, etc..), Oil and gas, utilities and heat energy,
- Monitoring and analysis of transport cargo traffic
- Ecological, biological and medical monitoring,
- Automation systems, life support systems and the class "smart house"
- Identification and prevention of emergency situations (monitoring seismic activity and volcanic activity, the analysis of the atmosphere and weather forecast for the timely prevention of the occurrence of natural disasters)
- and others [2].

Currently, the company offers modules DigiXBee (Figure 1) several options for network protocols - this is IEEE 802.15.4, ZigBee-2006, ZigBee Protocol and corporate DigiMesh. The main mode of modules XBee - is the work of running an external microcontroller, the control module using simple AT-commands or ordered data structure (mode API).

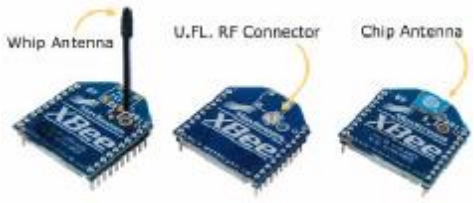

Figure 1. Appearance XBee modules with different antennas

In order to Model the ZigBee Network we buit a wireless network based on ZigbeeMAC (or, more precisely, IEEE 802.15.4 MAC) program Castalia. Consider the work of Zigbee, when its functionality is guaranteed time slot (GTS) on or off, as well as a time and without change. For all of these scenarios varies speed packet nodes represented with different presets [5].

To set the simulation parameters used in the Castalia configuration files [] (usually a file called omnetpp.ini), the file must be located in the folder of the simulation (we BANtest), which in turn must be in a folder Simulations of Castalia [3].

Figure 2 Y axis shows the average number of packets received at the node (node 0 receives packets from multiple nodes), the X-axis describes the transmission rate of each node, measured in packets / sec. Line GTSonnoTemporal with low traffic volume curve reaches its maximum (for example, 16 packets / sec / node 800 packets per node). Usually, the protocol works best when GTSon. This is what you can expect from the schemes TDMA, which give us a more efficient use of the wireless environment and reduce interference [4]. Performance of received packets is better when a channel has no temporal variation. Speed up large volumes of traffic, the first signs of saturation visible to GTSoff in general.

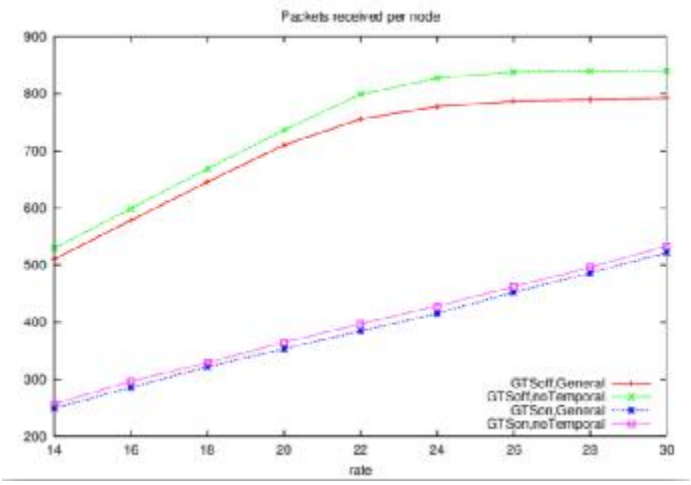

Figure 2. The packets which are received on one node at four different settings

For the simulation of schedule interference in a wireless sensor network used by the team and CastaliaResultsCastaliaPlot. In Figure 3 you can see clearly when sending packets parameter GTSon. It is obvious that the level of performance GTSoff high as the number of packets sent is much larger (see Figure 4).

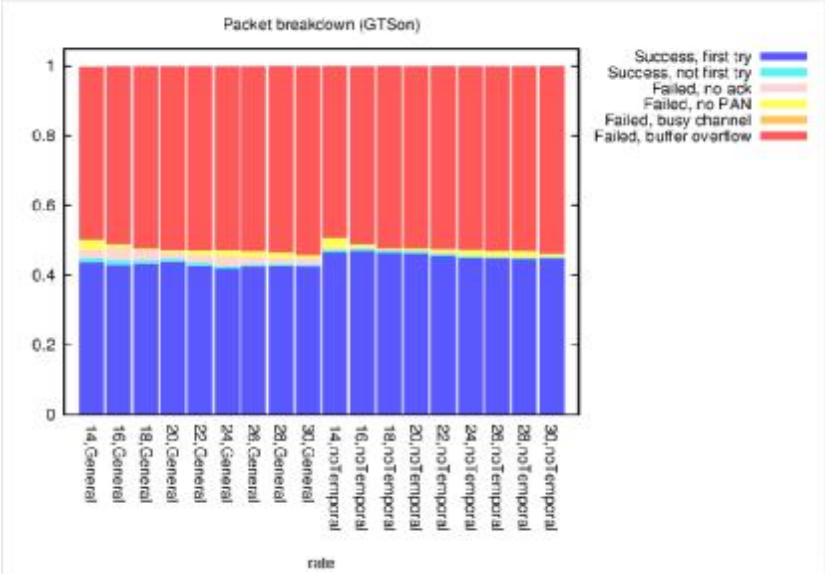

Figure 3. Effect of noise on the number of packets received at GTSon

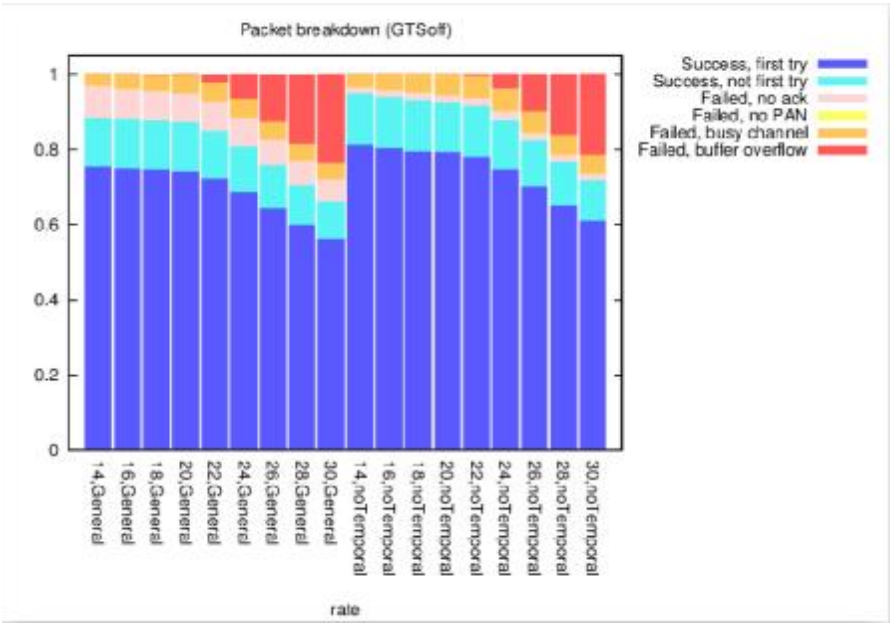

Figure 4. Effect of noise on the number of packets received at GTSoff

To implement the wireless network, in practice, we have put together one module to the board NI ELVIS II + and set it as a terminal device, the second unit was set up as the focal point with the help of the program X-CTU.

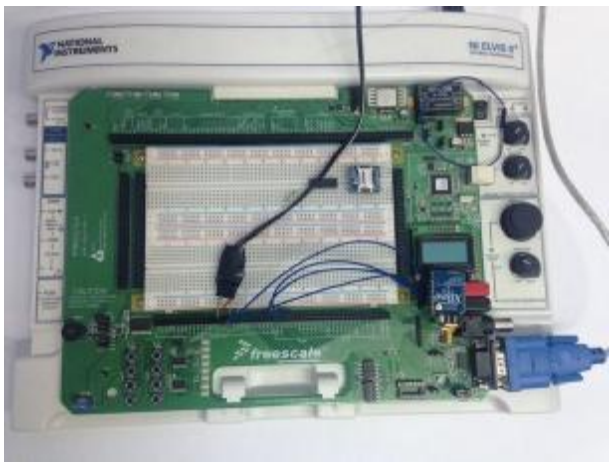

Figure 5. XBee module mounted on the board NI ELVIS II +

Figure 6.XBee module

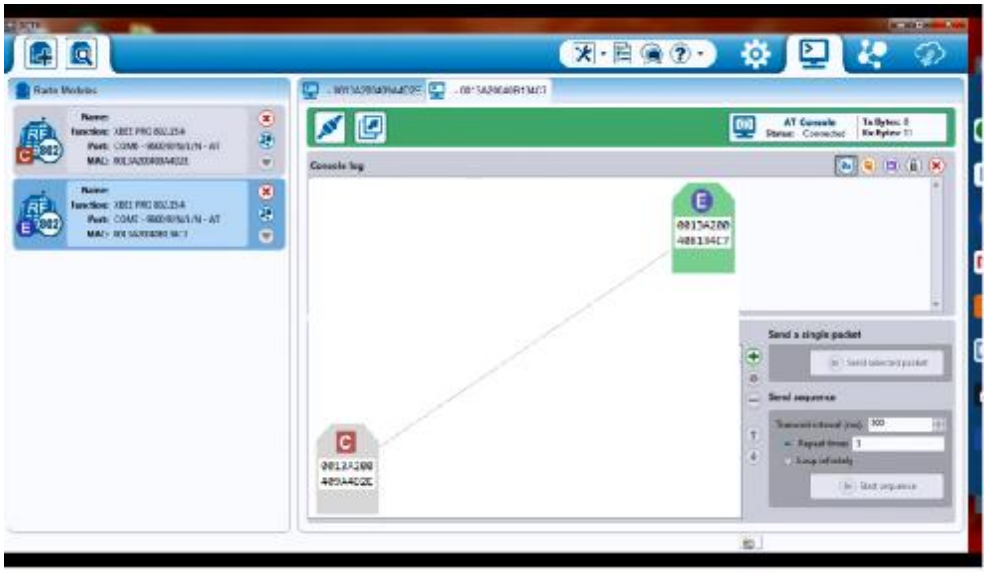

Figure 7. Firmware modules in X-CTU

Using the program X-CTU, we configured modules and can exchange messages in a window. Practical value of work consists in the possibility of using the results for the design, planning and calculating the limiting characteristics of wireless sensor networks.

In conclusion, here given an overview of features and functionality of wireless sensor networks. The mathematical methods for evaluating the reliability of wireless sensor networks. To analyze the system was chosen modeling Castalia, for which modules have been developed, allowing to perform modeling of interference and power radio transmission reliability data packet between two nodes and the reliability of information gathering wireless sensor network. The simulation results are presented in tables, charts and graphs.

The results are broadly consistent with the results of other researchers [5]. Based on the following conclusions: in assessing the reliability of the data packet between two nodes with an increase in the noise level to a certain value of a strong fall of reliability does not occur, the reliability of communication between the nodes depends on the topology, the signal power level no substantial effect on the reliability; when assessing the reliability of information-gathering network to network fluctuations reliability considered not significant at different levels of interference that may be caused by a good algorithm link layer.

References

1 Nitaigour, P.M. (Editor) Sensor networks and configuration fundamentals, standards, platforms, and applications / P.M. Nitaigour // Springer. — 2007. — 510 p.

2 Кучерявый, Е.А. Принципы построения сенсоров и сенсорных сетей / Е.А. Кучерявый, С.А. Молчан, В.В. Кондратьев // Электросвязь, 2006. — №6 — С.10-15.

3 Беспроводные системы на базе сенсорных сетей для автоматизации объектов нефтяной промышленности / URL: http://www.ipmce.ru/img/release/oil.pdf.

4 А.В. Прокопьев. Перспективы использования протокола 6LoWPAN в сетяхIEEE 802.15.4 // Электросвязь, 2009. — №1 — С.33-36.

5 R. Faludi.Building Wireless Sensor Networks // O'Reilly Media, 2010 — 320 p.